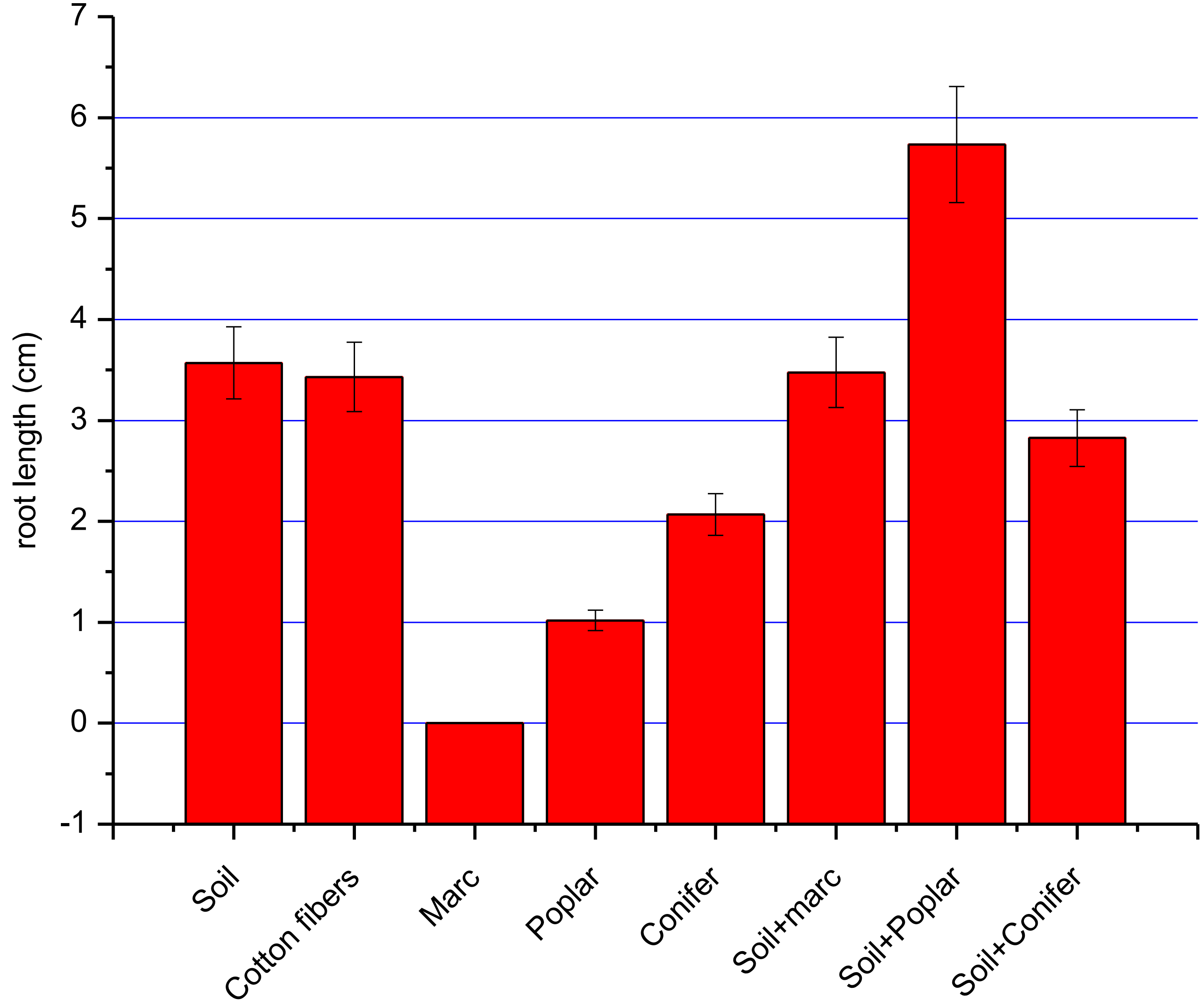
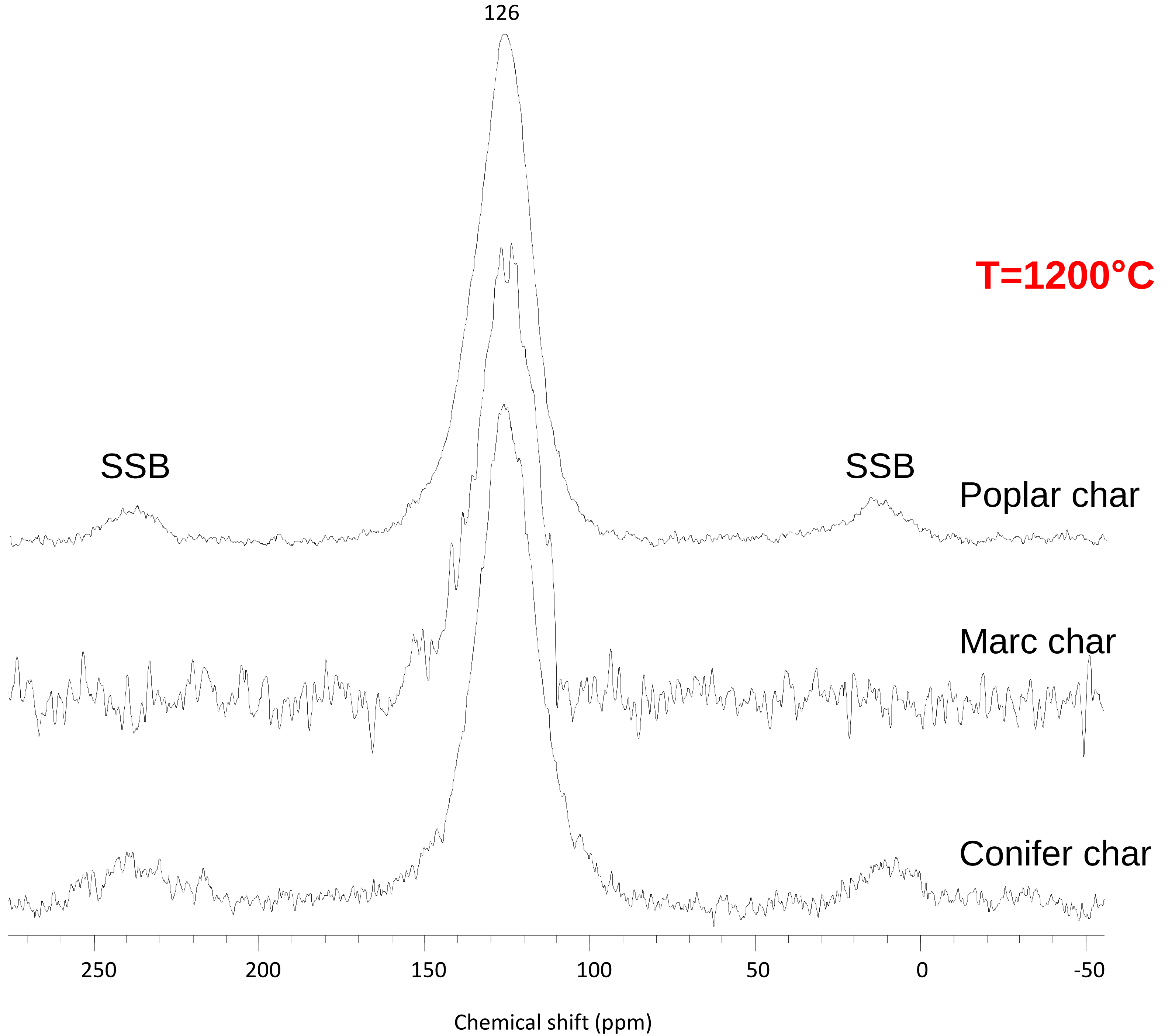
# Radish plants after 5 days



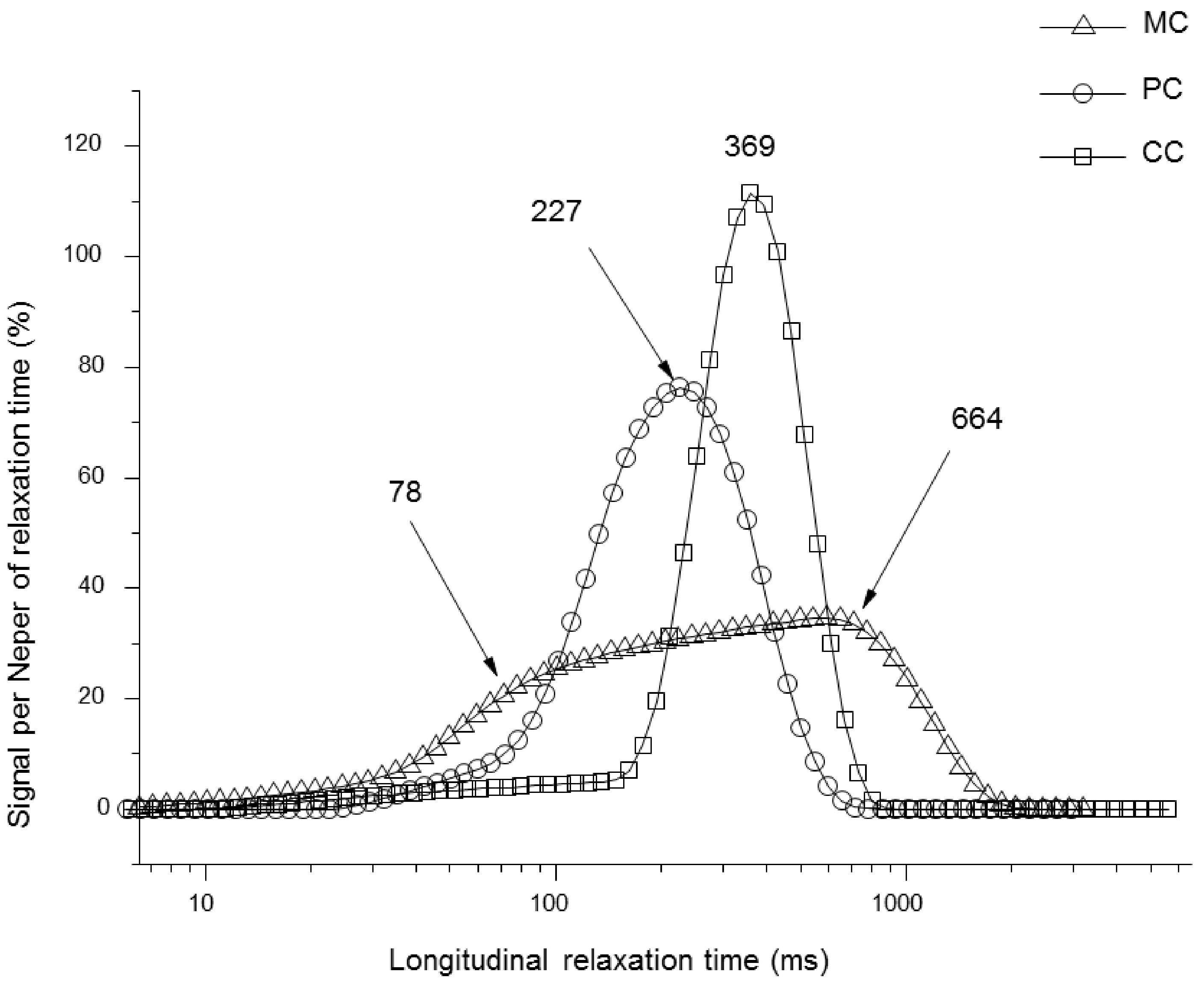
root length (cm)
7
6
5
4
3
2
1
0
-1
Soil
Cotton fibers
Marc
Poplar
Conifer
Soil+marc
Soil+Poplar
Soil+Conifer

| **Samples** | **Surface area ($m^2 \cdot g^{-1}$)** | **pH (in $H_2O$)** | **Ashes** | **C*** | **N*** | **Na** | **K** | **Ca** | **Fe** | **Cu** | **Mn** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **$g \cdot kg^{-1}$** | | | | | | | | |
| Marc char | 42±4 | 11.1±0.1 | 360±40 | 580±40 | 16±2 | 0.20±0.02 | 9.4±0.4 | 23.0±0.1 | 7.5±0.4 | 0.80±0.04 | 0.028±0.001 |
| Poplar char | 98±6 | 9.6±0.1 | 220±20 | 680±50 | 14±1 | 0.15±0.01 | 1.8±0.1 | 34.0±0.2 | 0.57±0.03 | 0.30±0.01 | 0.035±0.002 |
| Conifer char | 66±5 | 10.3±0.1 | 80±7 | 760±70 | 3.9±0.2 | 0.18±0.02 | 0.87±0.04 | 9.8±0.5 | 1.8±0.1 | 0.25±0.02 | 0.032±0.001 |

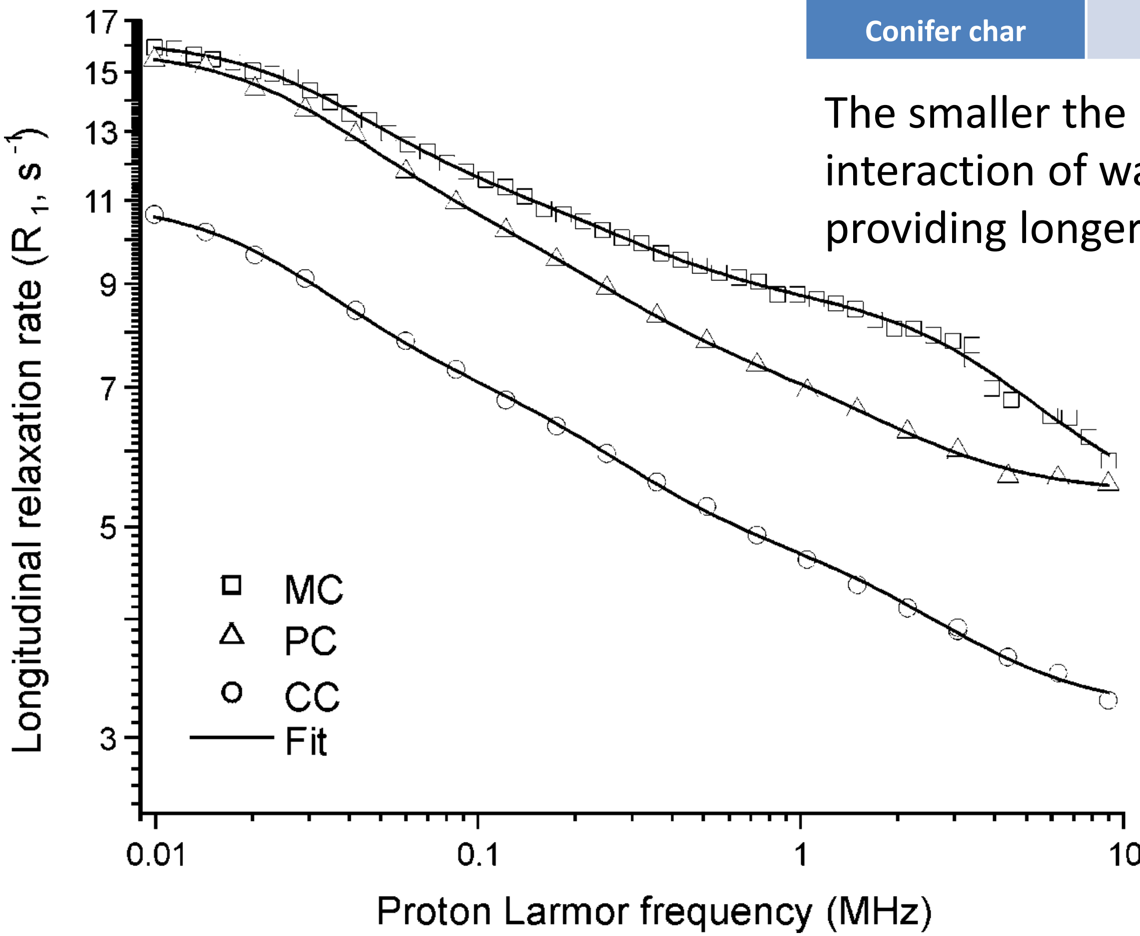

126
T=1200°C
SSB
SSB
Poplar char
Marc char
Conifer char
250
200
150
100
50
0
-50
Chemical shift (ppm)

poplar char is richer in small sized pores, whereas large pore sizes appear to be characteristic for the conifer char.

| Samples | Surface area ($m^2 \cdot g^{-1}$) |
|---|---|
| Marc char | 42±4 |
| Poplar char | 98±6 |
| Conifer char | 66±5 |



| Samples | α ($s^{-1}$) | β (x $10^6$ $s^{-2}$) | <τ> (x $10^{-6}$ $s^{-1}$) |
|---|---|---|---|
| Marc char | 5.1±0.5 | 32±3 | 0.35±0.03 |
| Poplar char | 5.4±0.5 | 7.6±0.8 | 1.4±0.1 |
| Conifer char | 3.2±0.3 | 8.1±0.8 | 0.95±0.08 |

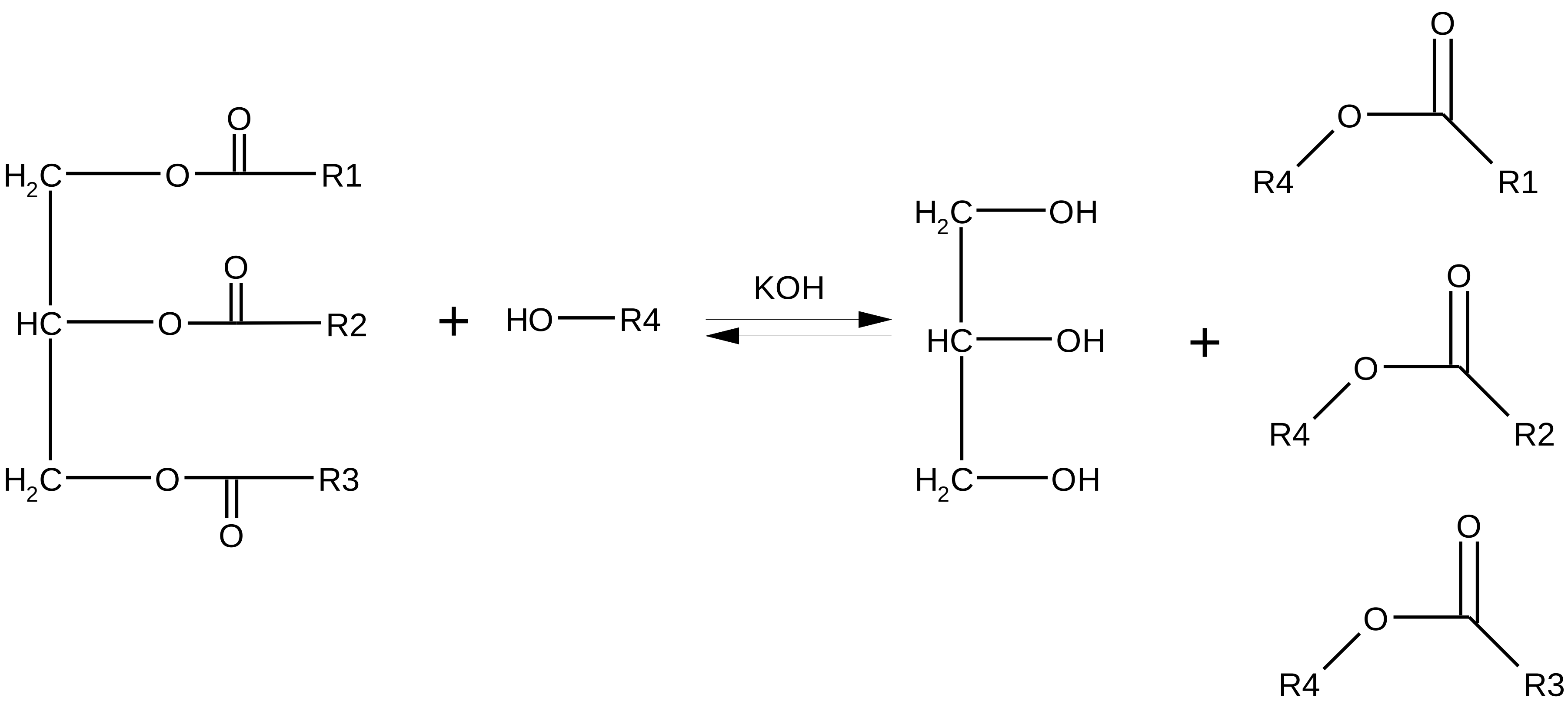



The smaller the pore size, the stronger is the interaction of water with the pore walls, thereby providing longer correlation time values

# A case study

# Monitoring transesterification for biodiesel production

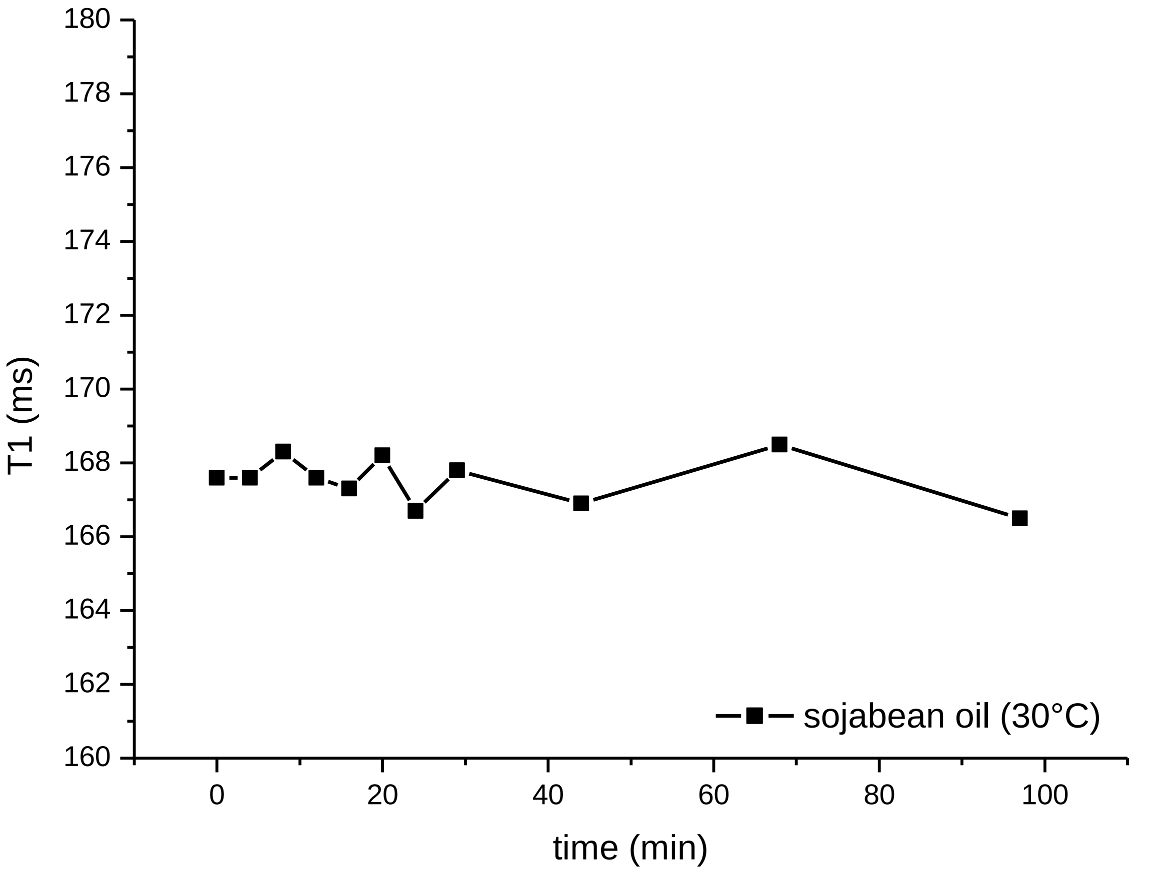
# The reaction



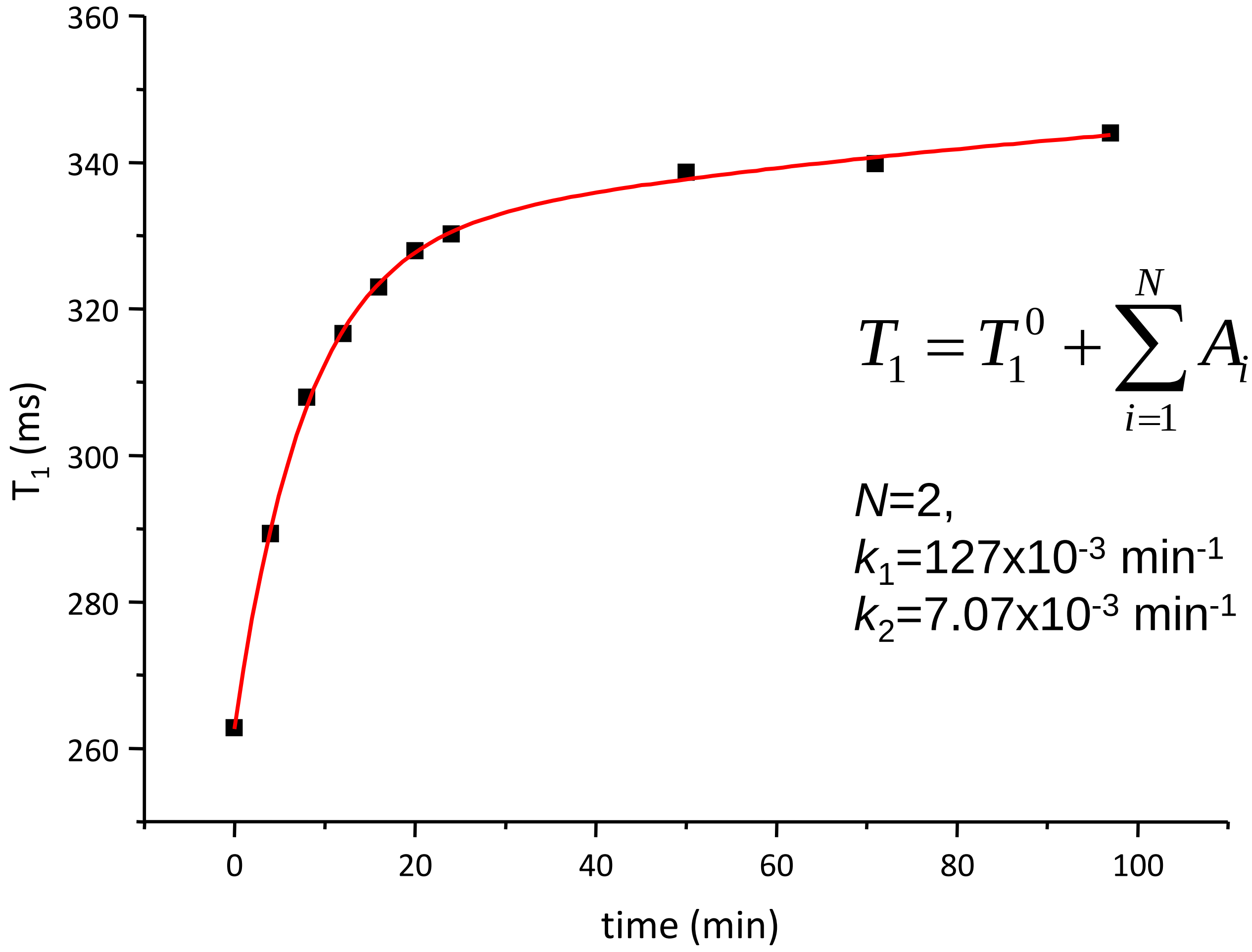
# Model used to account for the poly-exponential behavior of the recovery curves: stretched function

$$y = y_0 + M \exp\left(-\frac{x}{T_1}\right)^k$$

# Time $T_1$ variations of the sojabean oil at 30°C



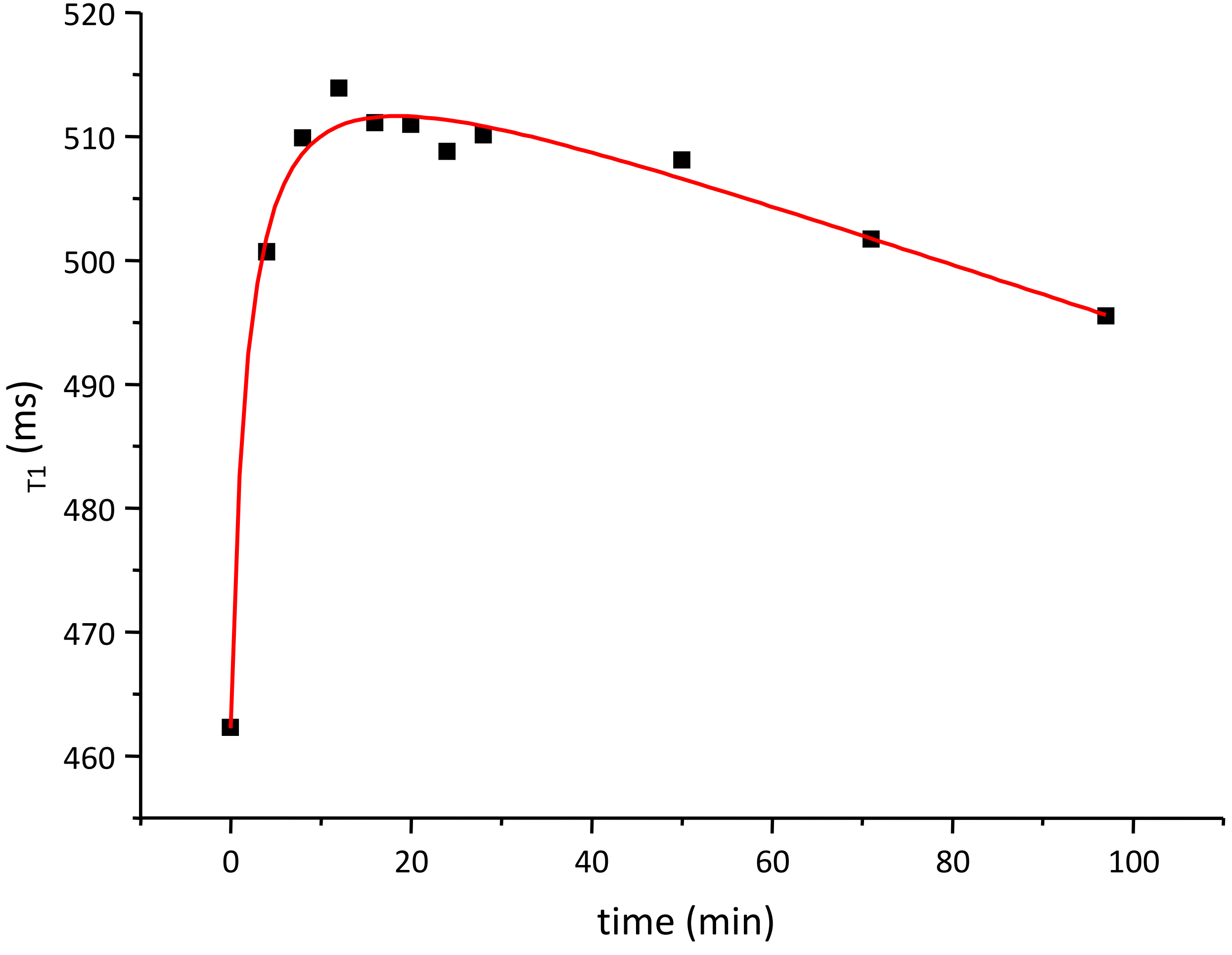
# Time $T_1$ variations of the sojabean oil added with MeOH/KOH (30°C)



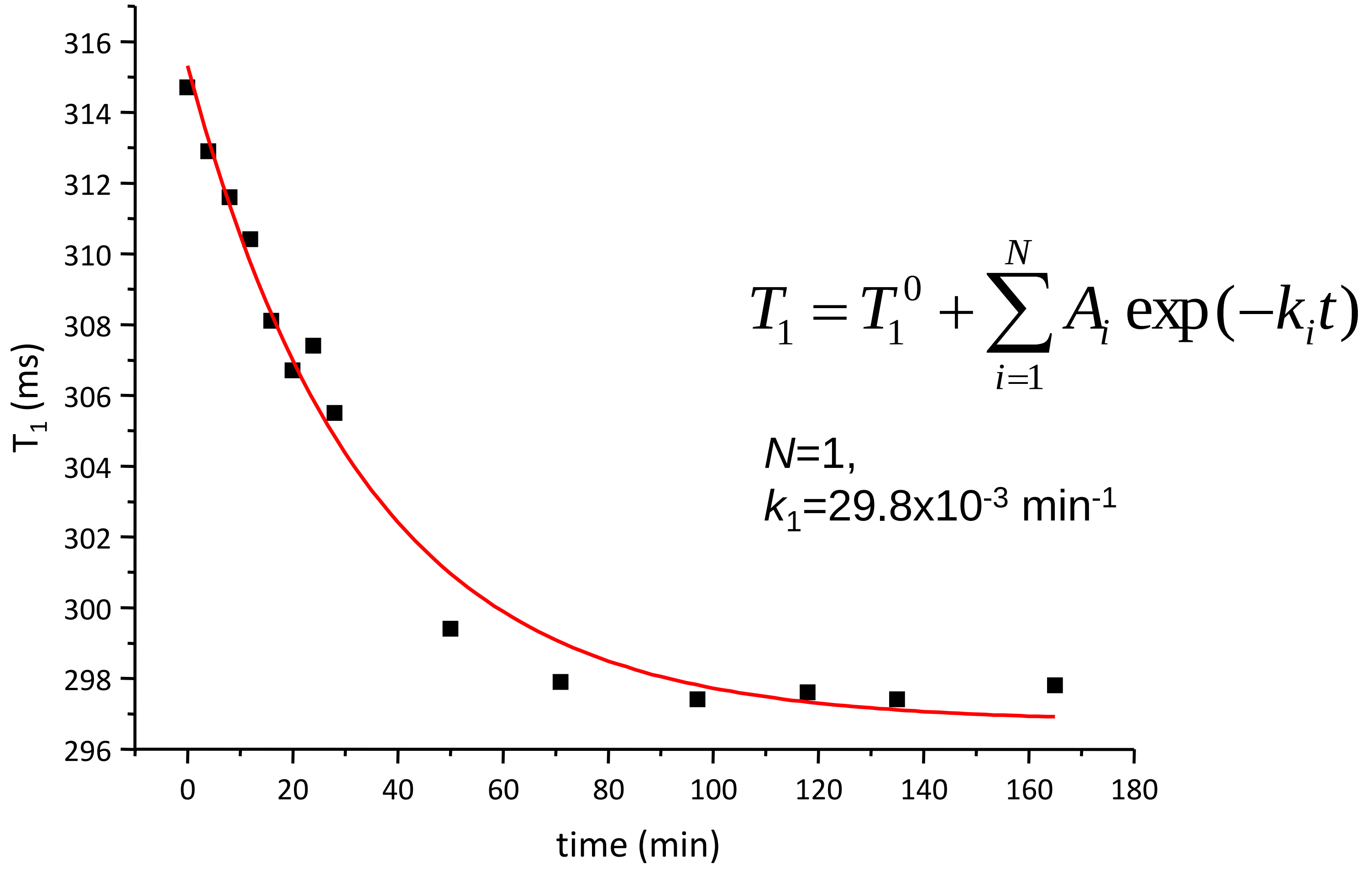

$$T_1 = T_1^0 + \sum_{i=1}^{N} A_i \exp(k_i t)$$

$N$=2,
$k_1$=127x10$^{-3}$ min$^{-1}$
$k_2$=7.07x10$^{-3}$ min$^{-1}$

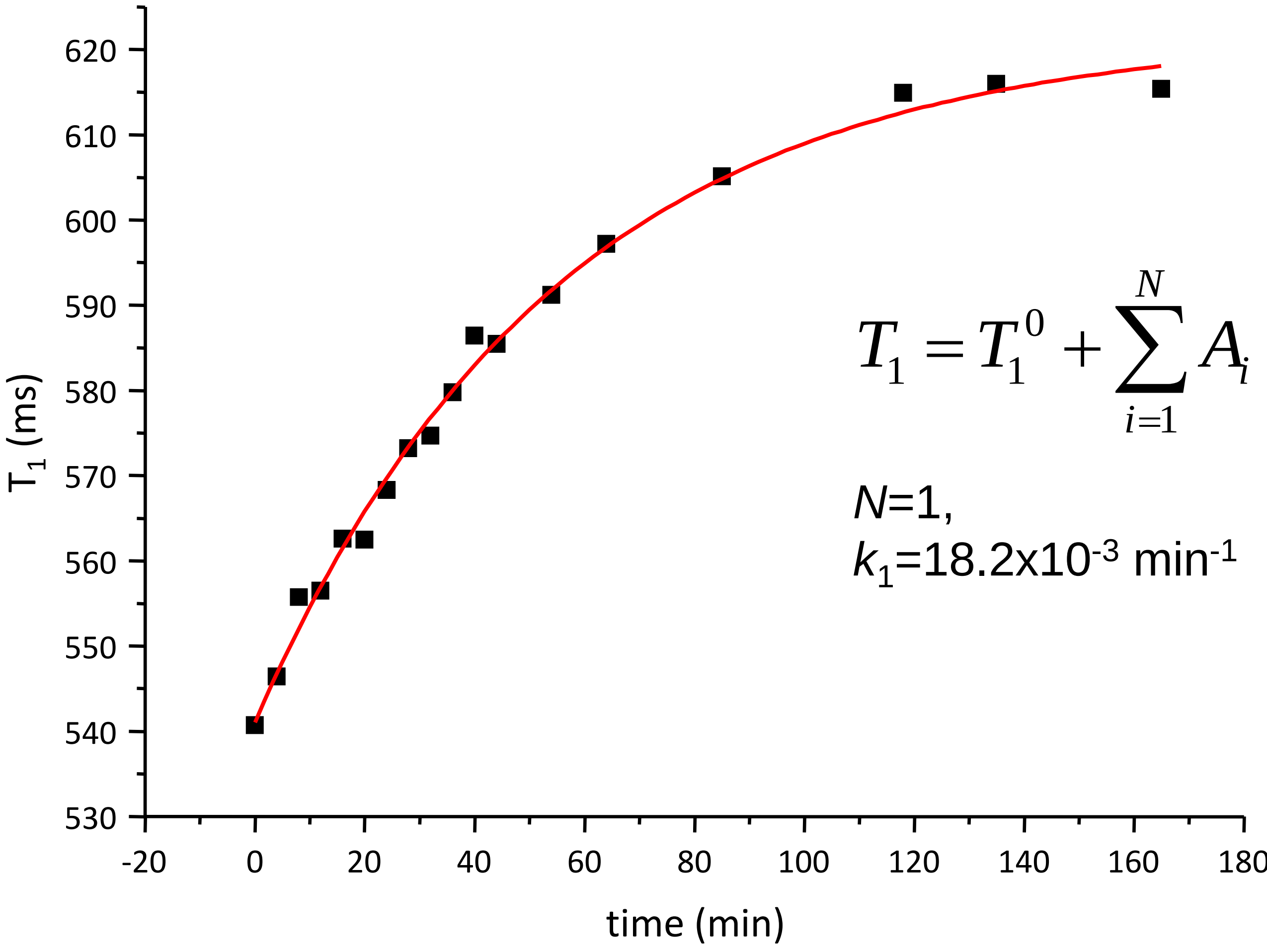
# Time $T_1$ variations of the sojabean oil added with EtOH/KOH (30°C)



# Time $T_1$ variations of the sojabean oil added with BuOH/KOH (30°C)



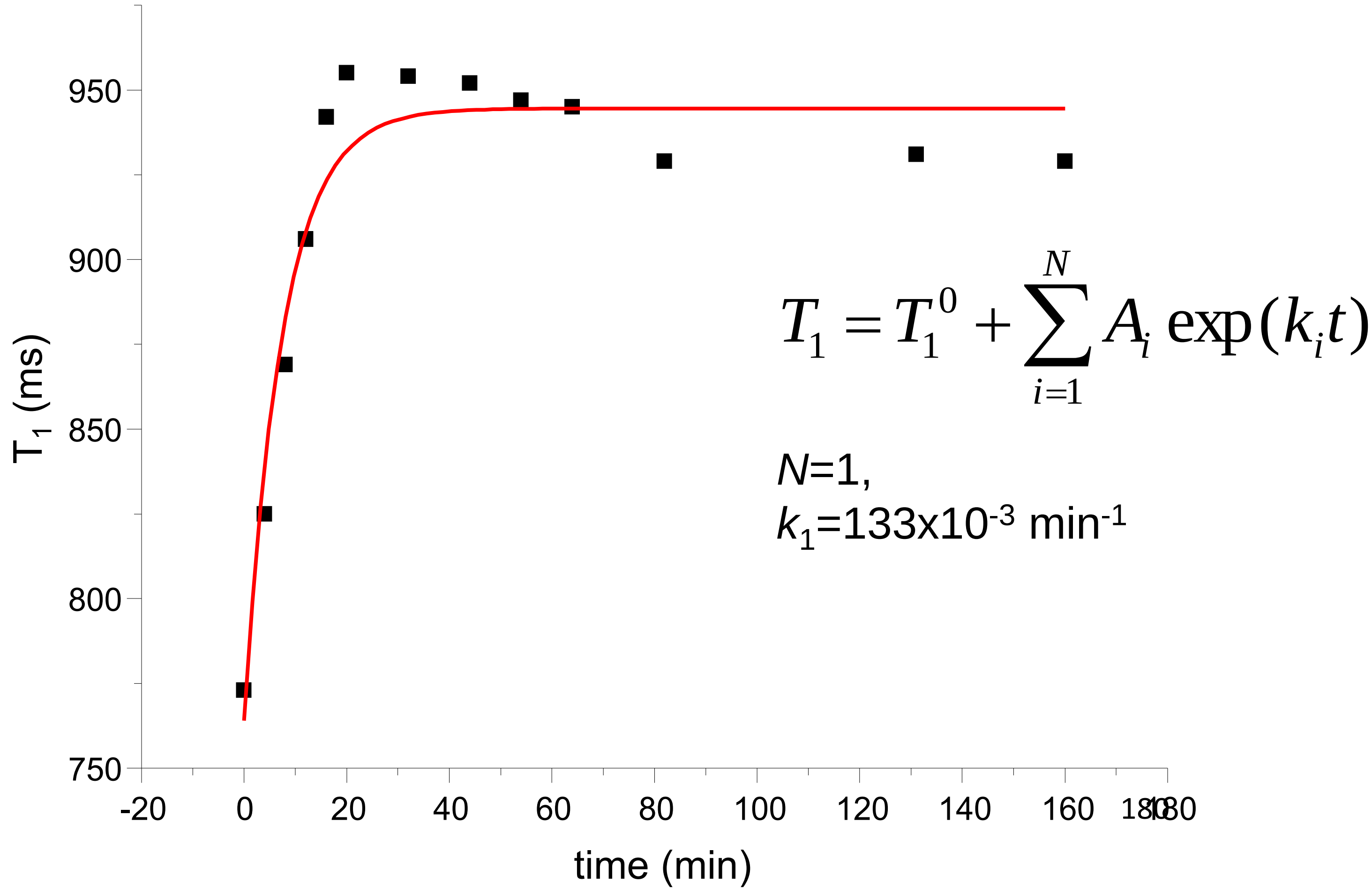
# Time $T_1$ variations of the sojabean oil added with BuOH/KOH (50°C)




$$T_1 = T_1^0 + \sum_{i=1}^{N} A_i \exp(k_i t)$$

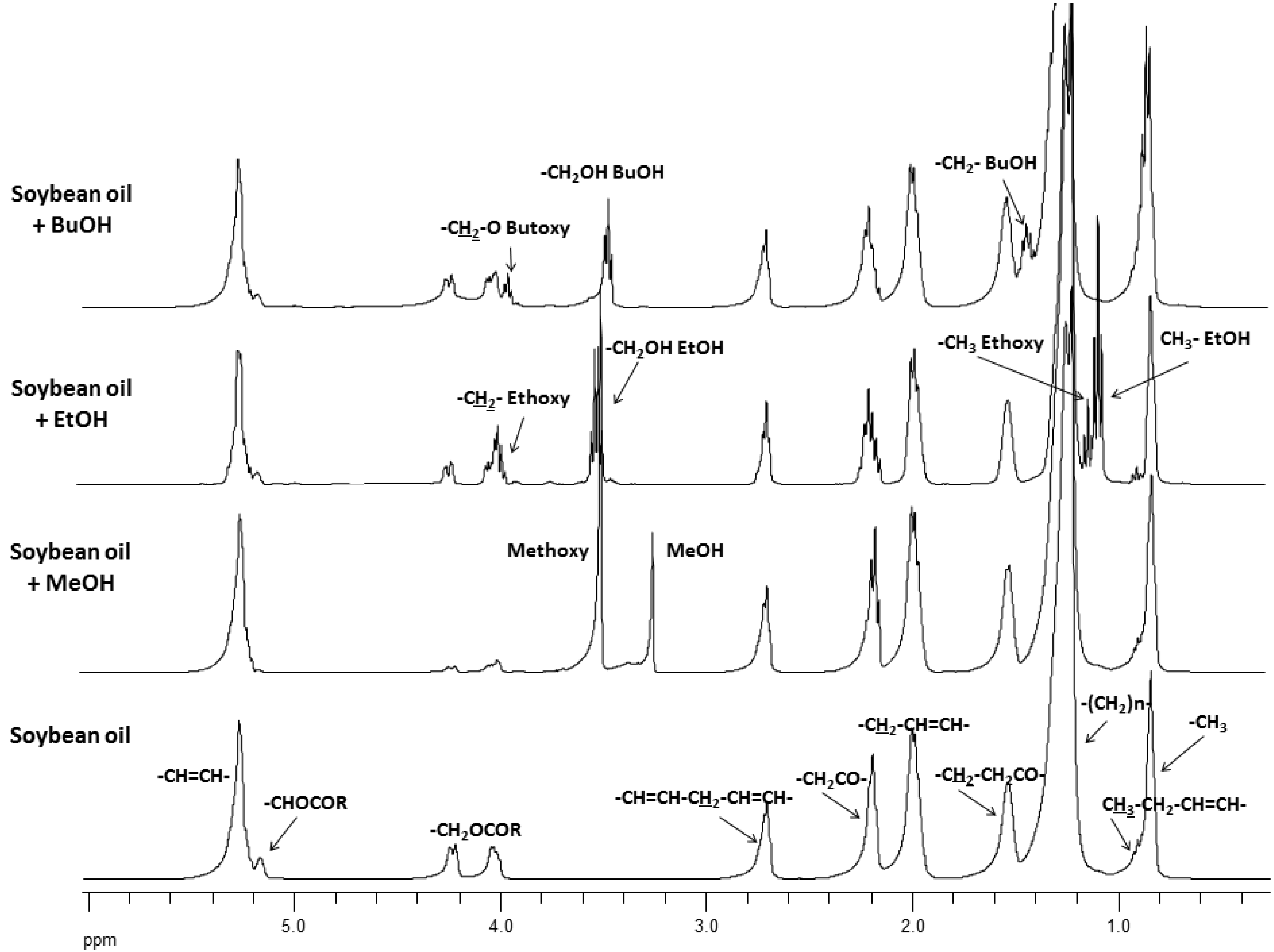
$N$=1,
$k_1$=18.2x10$^{-3}$ min$^{-1}$

# Time $T_1$ variations of the sojabean oil added with BuOH/KOH (70°C)



# GC-MS analysis of the methyl-esters obtained at 30°C

| KI | Area % | Compound | CAS |
|---|---|---|---|
| 1680 | 0.50 | Methyl tetradecanoate | 000124-10-7 |
| 1779 | 0.07 | Pentadecanoic acid, methyl ester | 007132-64-1 |
| 1886 | 0.73 | 9-Hexadecenoic acid, methyl ester, (Z)- | 001120-25-8 |
| 1938 | 21.85 | Hexadecanoic acid, methyl ester | 000112-39-0 |
| 2028 | 0.45 | Heptadecanoic acid, methyl ester | 001731-92-6 |
| 2093 | 28.61 | 8,11-Octadecadienoic acid, methyl ester | 056599-58-7 |
| 2113 | 22.51 | 9,12-Octadecadienoic acid (Z,Z)-, methyl ester | 000112-63-0 |
| 2175 | 2.70 | 9-Octadecenoic acid (Z)-, methyl ester | 000112-62-9 |
| 2177 | 2.53 | 9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)- | 000301-00-8 |
| 2189 | 5.54 | Octadecanoic acid, methyl ester | 000112-61-8 |
| 2193 | 2.09 | 9,12-Octadecadienoic acid, methyl ester | 002462-85-3 |
| 2196 | 0.40 | 10,13-Octadecadienoic acid, methyl ester | 056554-62-2 |
| 2198 | 0.79 | 9,11-Octadecadienoic acid, methyl ester, (E,E)- | 013038-47-6 |
| 2199 | 0.18 | 10-Nonadecenoic acid, methyl ester | 056599-83-8 |
| 2292 | 0.70 | 11,13-Eicosadienoic acid, methyl ester | 056599-57-6 |
| 2294 | 2.11 | 11-Eicosenoic acid, methyl ester | 003946-08-5 |
| 2339 | 2.40 | Eicosanoic acid, methyl ester | 001120-28-1 |
| 2430 | 0.36 | Heneicosanoic acid, methyl ester | 006064-90-0 |
| 2531 | 3.09 | Docosanoic acid, methyl ester | 000929-77-1 |
| 2632 | 0.41 | Tricosanoic acid, methyl ester | 002433-97-8 |
| 2674 | 1.78 | Tetracosanoic acid, methyl ester | 002442-49-1 |
| 2872 | 0.20 | Hexacosanoic acid, methyl ester | 005802-82-4 |



Soybean oil + BuOH
Soybean oil + EtOH
Soybean oil + MeOH
Soybean oil
-CH$_2$OH BuOH
-C$\underline{H_2}$-O Butoxy
-CH$_2$- BuOH
-CH$_2$OH EtOH
-C$\underline{H_2}$- Ethoxy
-CH$_3$ Ethoxy
CH$_3$- EtOH
Methoxy
MeOH
-CH=CH-
-CHOCOR
-CH$_2$OCOR
-CH=CH-C$\underline{H_2}$-CH=CH-
-CH$_2$CO-
-C$\underline{H_2}$-CH=CH-
-C$\underline{H_2}$-CH$_2$CO-
-(CH$_2$)n-
-CH$_3$
C$\underline{H_3}$-CH$_2$-CH=CH-
5.0
4.0
3.0
2.0
1.0
ppm

**THANK YOU FOR YOUR ATTENTION**